

4/26/17 "Too many of us are not living our dreams because we are living our fears."-Les Brown

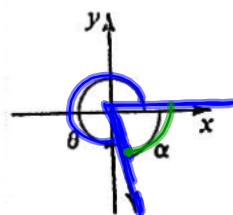
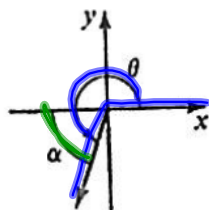
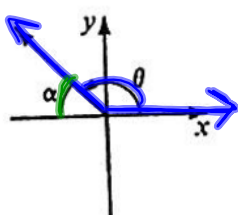
HW: "Angles" Exercise Set B, C, D even numbers only
Test 1 on Tuesday 5/2

AIM: What are Reference Angles?

Warm Up:

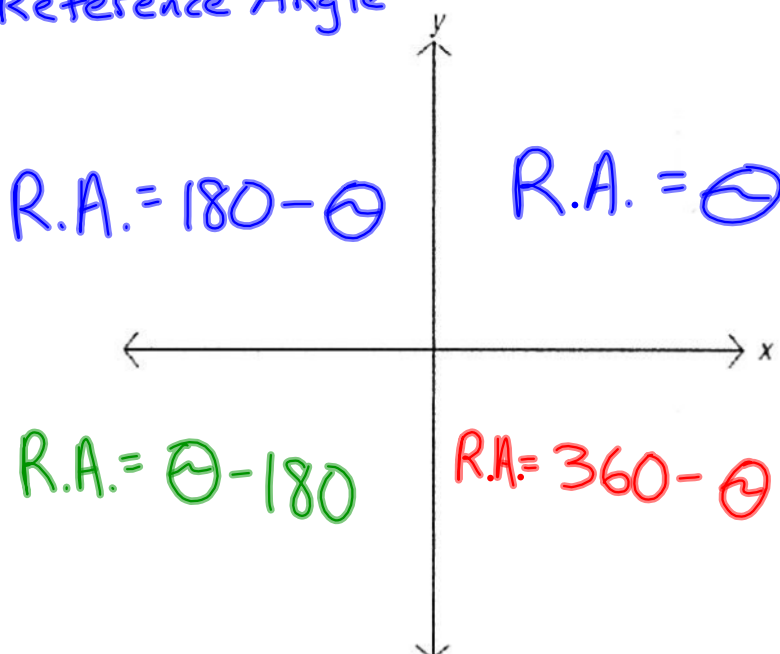
⊛ Positive acute: An angle between 0° and 90°

Given an angle θ in standard position, the reference angle of θ , is the positive acute angle formed by the terminal side of θ and the positive or negative portion of the x -axis. In each of the following figures, angle α is the reference angle of angle θ .

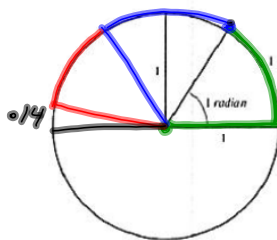


Reference angles will help you to express the sine, cosine or tangent of any angle in terms of the sine, cosine or tangent of a positive acute angle.

RA = Reference Angle



The degree is not the only unit for measuring angles. Another unit, called the radian, is more commonly used in advanced mathematics. An angle of 1 **radian** (drawn in standard position, measured counterclockwise) is a central angle that intercepts an arc equal in length to the radius of the circle.



An angle of 2 radians intercepts an arc twice as long as the radius of the circle, and so on. In general, an angle θ (theta) radians will intercept an arc θ times as long as the radius.

If θ is the measure in radians of a central angle of a circle, s is the length of the intercepted arc, and r is the radius of the circle, then:

$$s = \theta r$$

$$s = |\theta| r$$

$$\text{or } |\theta| = \frac{s}{r}$$

$$\theta = \frac{s}{r}$$

$$* C = 2\pi r$$

Let's find a conversion from radians to degrees:

Since a circle of radius 1 has a circumference of 2π .

Substituting into the formula $s = r\theta$

Therefore:

$$2\pi = 1 \cdot \theta = \theta$$

$$2\pi = 360^\circ$$

$$\pi = 180^\circ$$

* To convert from radians to degrees:

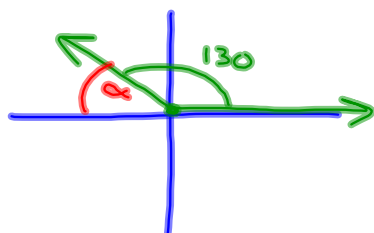
Replace π with 180°

* To convert degrees to radians:

Multiply by $\frac{\pi}{180}$ and reduce

- a. Sketch the given angle in standard position, then sketch its reference angle.
Label the reference angle as angle α .
- b. State the measure of angle α .

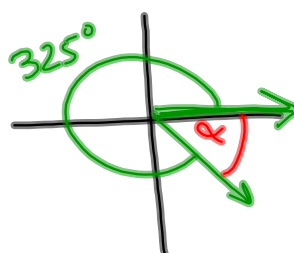
1. 130°



$$\alpha = 180 - 130$$

$$\alpha = 50^\circ$$

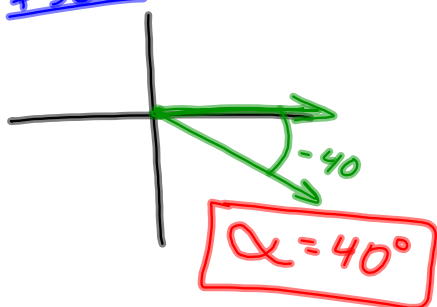
3. 325°



$$\alpha = 360 - 325$$

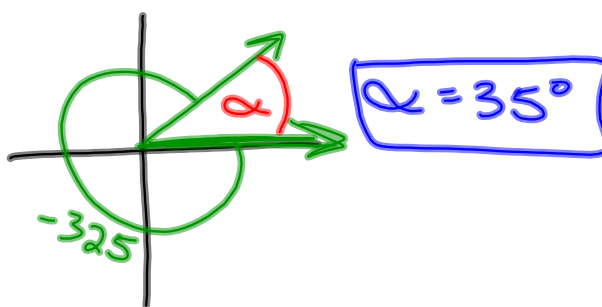
$$\alpha = 35^\circ$$

5. $-40^\circ =$ coterminal 320°
 $+360$



$$\alpha = 40^\circ$$

7. $-325^\circ + 360 = 35^\circ$



$$\alpha = 35^\circ$$

9. $-\frac{5\pi}{3}$

In 1–9, express in degrees the angle whose radian measure is given.

1. $\frac{4\pi}{3} = \frac{4(180)}{3} = 240^\circ$ 3. $\frac{2\pi}{5}$

5. $\frac{5\pi}{9}$

In 11–19, express in radians the angle whose degree measure is given.

11. $15^\circ \cdot \frac{\pi}{180}$

13. 105°

15. 160°

$$\frac{15\pi}{180} = \left(\frac{1\pi}{12} \right)$$

1. In a circle of radius 8 inches, find the length of the arc intercepted by a central angle of 1.5 radians.

3. In a circle with radius 5 inches, find the length of an arc intercepted by a central angle of 45° .